

What is claimed is:

1. A semiconductor device that includes a P-channel type MOS field effect transistor (PMOSFET), comprising:

a semiconductor substrate;

a gate oxide film positioned on the semiconductor substrate;

a gate electrode positioned on the gate oxide film; and

two P⁺ source and drain diffusion areas, each of which has a P⁻ offset area, that are formed in an n-well region inside the semiconductor substrate; wherein

at least one of the gate electrode, the gate oxide film and the offset areas contains fluorine.

2. The semiconductor device according to Claim 1, wherein at least one of the gate electrode, the gate oxide film and the offset areas contains the fluorine as either a single element or boron fluoride.

3. The semiconductor device according to either Claim 1 or Claim 2, further characterized that the gate oxide film contains nitrogen.

4. A manufacturing method of a semiconductor device that includes a P-channel type MOS field effect transistor, comprising:

forming a gate oxide film on a semiconductor substrate;

forming a gate electrode on the gate oxide film;

forming P⁻ offset areas in the semiconductor substrate;

forming P⁺ source and drain diffusion areas in the semiconductor substrate; and

including fluorine in the gate electrode, wherein said including is implemented after any one of:

forming the gate electrode;

forming the offset areas; and

forming the source and drain diffusion areas.

5. The manufacturing method of a semiconductor device according to Claim 4 characterized that the gate electrode contains the fluorine as either a single element or boron fluoride.

6. The manufacturing method of a semiconductor device according to either Claim 4 or Claim 5, further comprising including nitrogen into the gate oxide film either during or after a process step of forming the gate oxide film.

7. A manufacturing method of a semiconductor device that includes a P-channel type MOS field effect transistor, comprising:

forming a gate oxide film on a semiconductor substrate;

forming a gate electrode on the gate oxide film;

forming P⁻ offset areas in the semiconductor substrate;

forming P⁺ source and drain diffusion areas in the semiconductor

substrate; and

including fluorine into the gate oxide film after any one of

forming the gate oxide film;

forming the gate electrode;

forming the offset areas; and

forming the source and drain diffusion areas.

8. The manufacturing method of a semiconductor device according to Claim 7 characterized that the gate oxide film contains the fluorine as either a single element or boron fluoride.

9. The manufacturing method of a semiconductor device according to either Claim 7 or Claim 8, further comprising including nitrogen into the gate oxide film either during or after a process step of forming the gate oxide film.

10. A manufacturing method of a semiconductor device that includes a P-channel type MOS transistor, comprising:

forming a gate oxide film on a semiconductor substrate;

forming a gate electrode on the gate oxide film;

forming P⁻ offset areas in the semiconductor substrate;

forming P⁺ source and drain diffusion areas in the semiconductor substrate; and

including fluorine into the offset areas after forming the offset areas.

11. The manufacturing method of a semiconductor device according to Claim 10 characterized by a feature that the above offset areas contain the fluorine as either a single element or boron fluoride.
12. The manufacturing method of a semiconductor device according to either Claim 10 or Claim 11, further including nitrogen into the gate oxide film either during or after a process step of forming the gate oxide film.
13. The method according to claim 4, wherein the fluorine is included in the gate electrode by ion implantation.
14. The method of claim 13, wherein the accelerating energy of the ion implantation is controlled.
15. The method according to claim 7, wherein the fluorine is included in the gate oxide film by ion implantation.
16. The method of claim 15, wherein the accelerating energy of the ion implantation is controlled.
17. The method according to claim 10, wherein the fluorine is included in the offset areas by ion implantation.

18. The method of claim 17, wherein the accelerating energy of the ion implantation is controlled.

19. A manufacturing method of a semiconductor device that includes a P-channel type MOS field effect transistor, comprising:

forming a gate oxide film on a semiconductor substrate;

forming a gate electrode on the gate oxide film;

forming P- offset areas in the semiconductor substrate;

forming P+ source and drain diffusion areas in the semiconductor substrate; and

including fluorine in the source and drain diffusion areas, wherein said including is implemented after forming the source and drain diffusion areas.

20. The method according to claim 19, wherein the fluorine is included in the source and drain diffusion areas by ion implantation.

21. The method of claim 20, wherein the accelerating energy of the ion implantation is controlled.

22. The method of claim 20, wherein the ion implantation is done using boron fluoride, and accelerating energy of ion implantation with the boron fluoride is controlled so that the distance from a principal surface to a first depth, down to which ion implantation with boron fluoride (BF₂) is

implemented is shorter than a distance from the principal surface to a second depth, down to which ion implantation with boron (B) is implemented.

23. The method of claim 20 wherein the ion implantation is done using boron and boron fluoride, and the accelerating energy of ion implantation with boron fluoride is smaller than that with boron.

24. The method of claim 19 wherein ion implantation is prevented in offset areas below side walls.

25. The method of claim 13, wherein ion implantation with boron fluoride is shallowly performed after forming side walls on a side portion of the gate electrode, and ion implantation with boron is deeply performed after performing ion implantation with boron fluoride.